



Increment 34/35 Science Symposium
June, 2012



Cell Bio Tech Demo Team

- NASA ARC ISS Utilization Office - Functionality Projects
 - NASA MSFC (Ops and Crew Training)
 - JSC (PIM)
- Tissue Genesis, Inc. (CBTD Hardware Developer)





Bioculture System for ISS

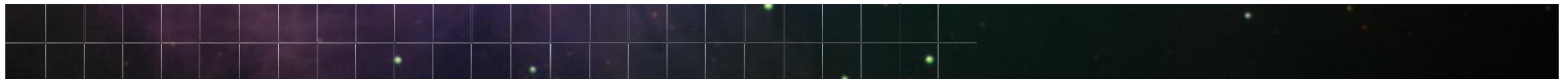
- NASA ARC ISS Utilization Office is developing the next generation incubator that will be dedicated to life science space flight research:
 - Mammalian and non-mammalian cell cultures (adherent, suspension, 3D)
 - Microbiology cultures (prokaryotic and eukaryotic)
- Capabilities
 - Multiple independent experiment sub-housings
 - Closed loop flow path system allowing medium oxygenation and perfusion
 - Independent temperature control
 - 3 levels of containment (closed loop plus 2 additional covers)
 - Automated systems for injection of fixatives, factors, etc.
 - Automated environmental gas supply (not independent)
 - Crew access for on-orbit experiment initiation, change-out of specimens and media bags, specimen injection into biospecimen chambers, sub-culturing, sampling, factor injection, and use of other ISS science facilities



Overview of Cell Bio Tech Demo

- The design of the Bioculture System is based on heritage systems and subsystems of the Cell Culture Module (flown on 20 Space Shuttle missions)
 - Independent closed loop media flow path systems (including hollow fiber bioreactors) for independent experiment or replicates (group housed)
 - Automated pumps and solenoids for medium perfusion, sampling, fixative and factor injections
 - Active and passive environmental control
 - 2 levels of containment
- New Capabilities
 - Independent flow paths that are individually housed with 2 additional levels of containment
 - Independent temperature control
 - Crew access to the flow path allowing on-orbit:
 - Specimen injection into the biospecimen chamber
 - Sampling and sample transfer
 - Subculturing
 - Change out of consumables

Cell Bio Tech Demo will conduct on-orbit tests and demonstrate selected new capabilities to verify their design and function for use in the Bioculture System





Cell Bio Tech Demo Objectives

1. Demonstrate that the tools and procedures used to introduce or remove specimens from a medium bag can be completed on-orbit without the introduction of a microbial contaminant into the liquid medium
2. Demonstrate the on-orbit functional compatibility of Bioculture Systems components and tools with ISS Wetlab kit items
3. Demonstrate the introduction of a biological specimen into the medium bag and sealing of flow paths using candidate tools
4. Demonstrate use of a candidate tubing cutter and crimp tubing for sealing and maintaining sterility on-orbit
5. Obtain crew feedback concerning BIOS components and their on-orbit operation, utilize that feedback in the development of BIOS crew procedures.
6. Support NASA education/outreach by distributing the tech demo biological samples obtained as a result on-orbit operations



Cell Bio Tech Demo Launch and Operations

SpX-2 Launch: 12/12
 Return: 1/13

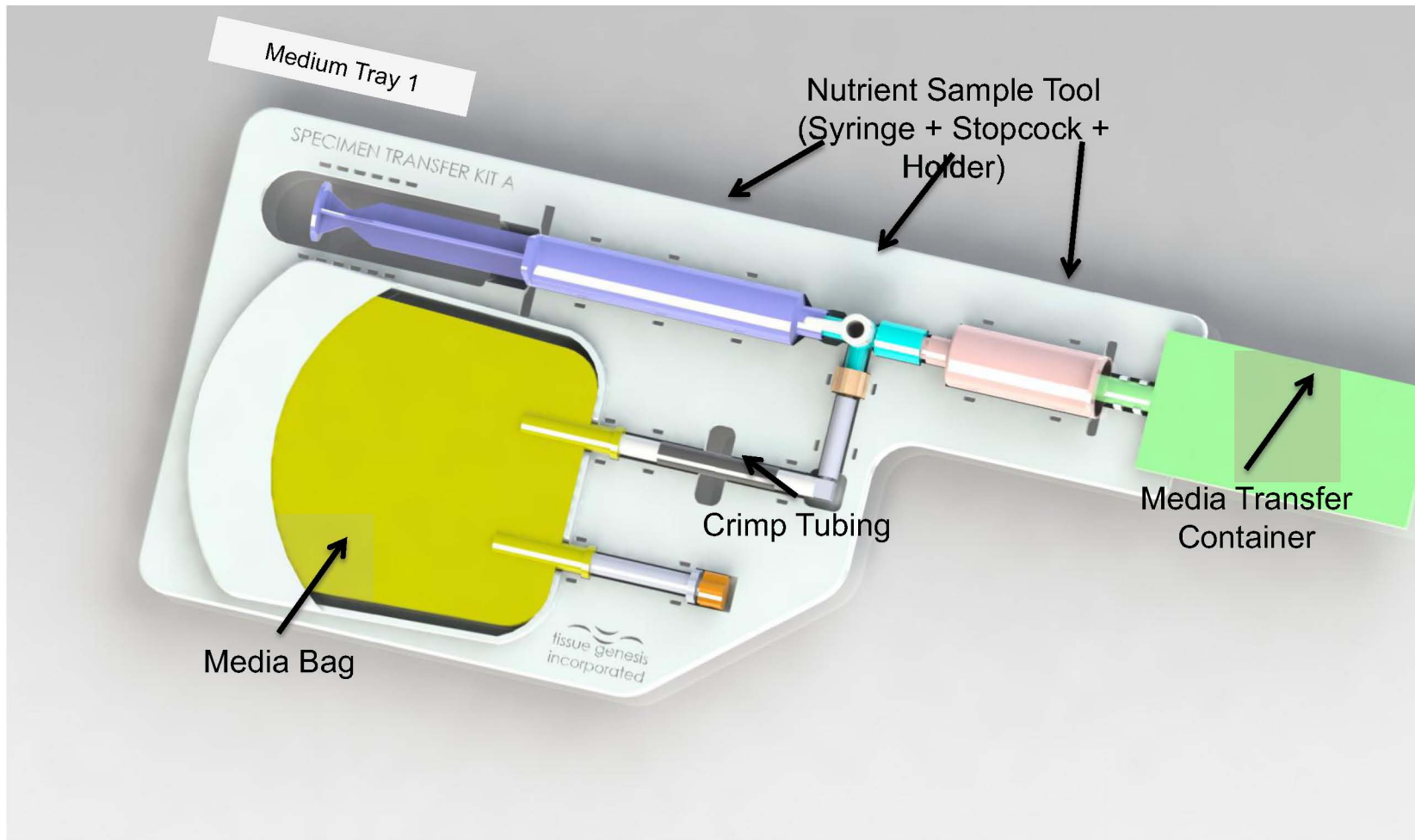
On-Orbit Operations

- 1) Demonstrate use of transfer tool and specimen container and maintenance of sterility; demonstrate new crimp cut tubing and cutter
- 2) Demonstrate transfer of medium from one bag to another bag and maintenance of sterility; demonstrate new crimp cut tubing and cutter
- 3) Demonstrate transfer of a “specimen” to an OptiCell for interface with an ISS processing facility
- 4) Demonstrate transfer of a biological specimen (*S. cerevisiae*) to a media bag

Medium Tray 1



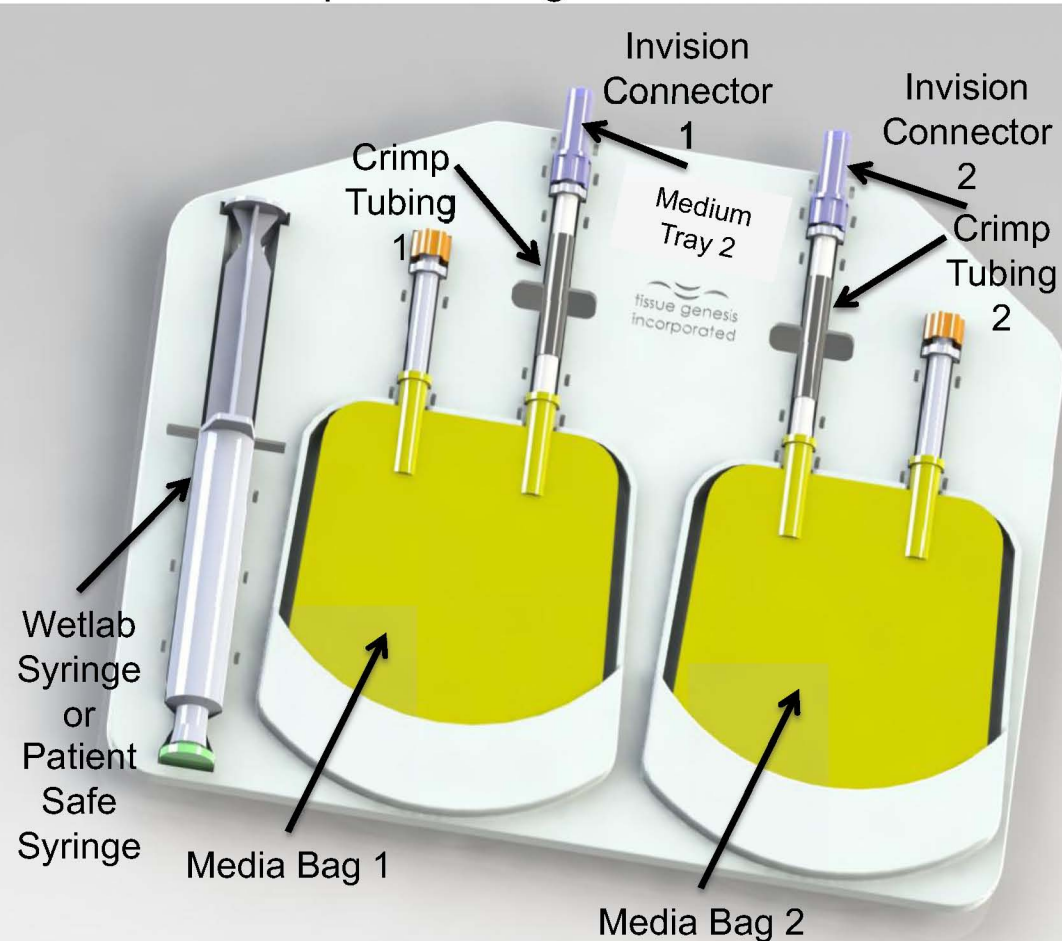
Ops: Demonstrate use of transfer tool and specimen container and maintenance of sterility; demonstrate new crimp cut tubing and cutter



Medium Tray 2



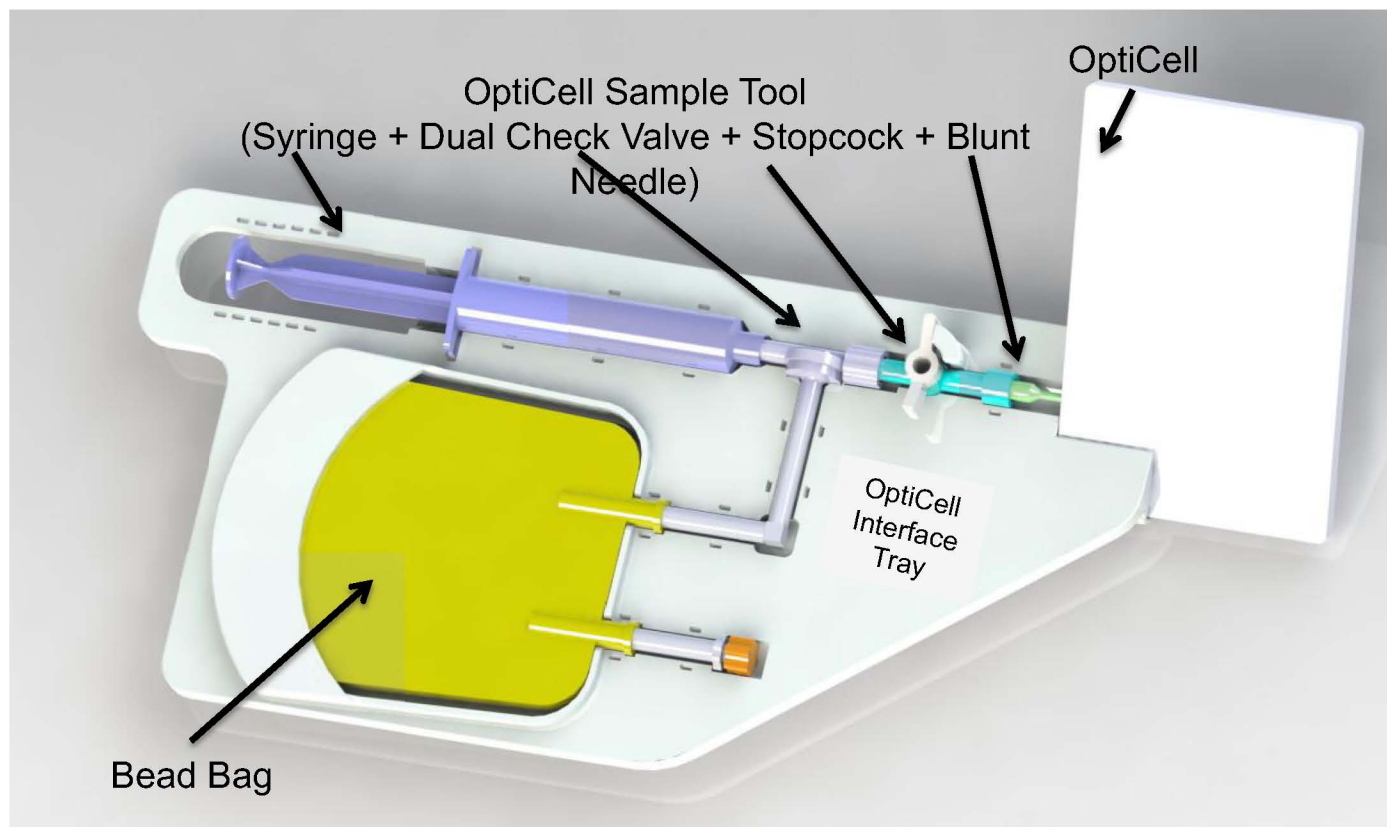
Ops: Demonstrate transfer of medium from one bag to another bag and maintenance of sterility; demonstrate new crimp cut tubing and cutter



Opticell Interface



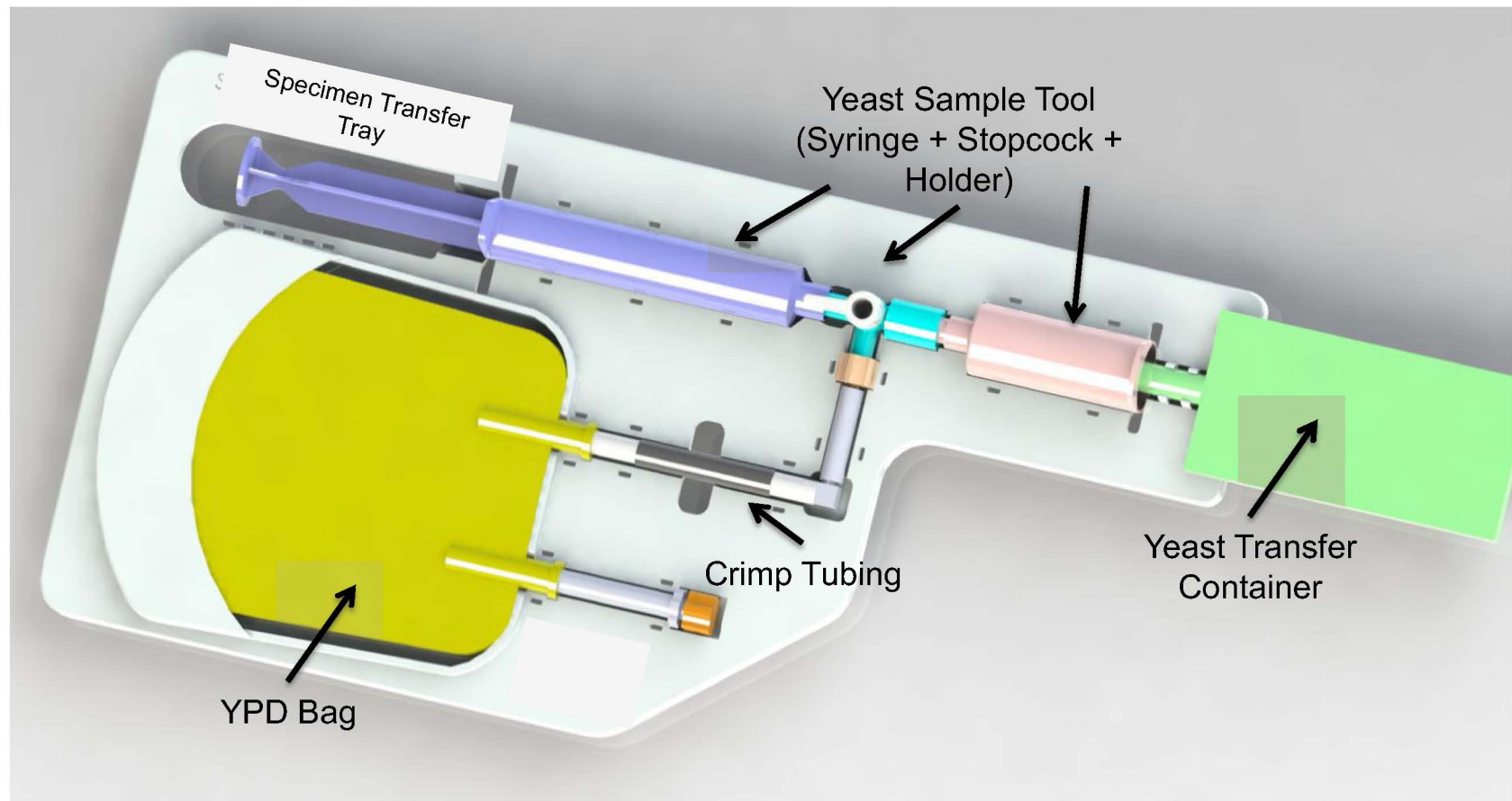
Ops: Demonstrate transfer of a “specimen” to an OptiCell for interface with an ISS processing facility



Specimen Transfer



Ops: Demonstrate transfer of a biological specimen (*S. cerevisiae*) to a media bag





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